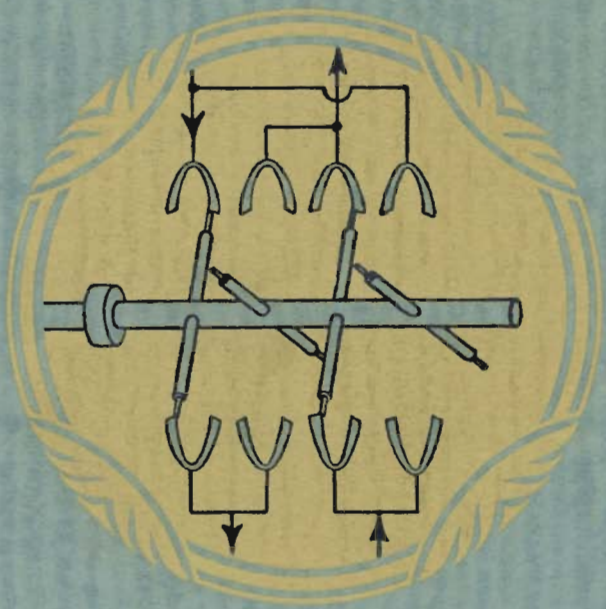
SNOOK

X-RAY APPARATUS



There is only one **SNOOK**!

GENERAL ELECTRIC
X-RAY CORPORATION

Formerly Victor X-Ray Corporation

SNOOK
X-RAY APPARATUS

140 Kv. P.
Diagnostic and Light Therapy

200 Kv. P.
Combination Deep Therapy and Diagnostic

GENERAL ELECTRIC
X-RAY CORPORATION
Formerly Victor X-Ray Corporation

Manufacturers of the Coolidge Tube and complete line of X-Ray Apparatus Physical Therapy Apparatus, Electrocardiographs, and other Specialties

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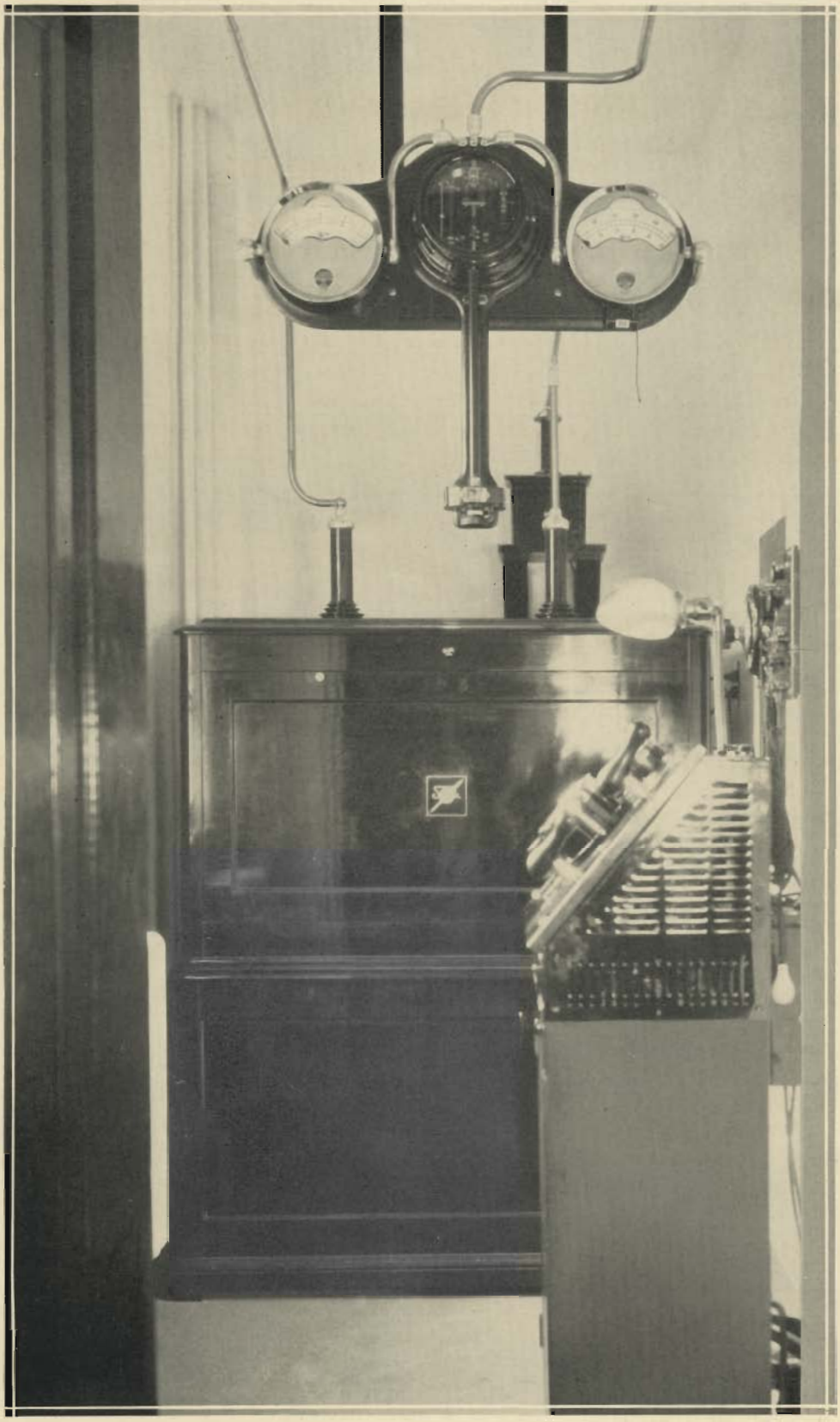


Over Twenty Years of Snook Supremacy

THE first Snook X-ray machine was manufactured in 1907, the same year that its inventor, H. Clyde Snook of Philadelphia, described his machine in a paper before the International Roentgen Congress held in Amsterdam, Holland.

It was the simplest device that had ever been built for properly exciting the X-ray tube. The efficiency of the machine was considerably greater than that of the induction coil then in general use. It was capable of much greater output and yet was much easier to control. There was no possibility of inverse current entering the tube, and the troubles incident to interrupters were at once eliminated.

The invention of this machine was heralded by scientific men the world over as the greatest step in advancement since the discovery of the rays.

Even today there is only one *Snook*, not only in name, but also in respect to design. It is the only X-ray machine in the world in which the cross-arm type of rectifier as originally laid out by Mr. Snook is used. The Snook machine of the present obviously offers certain definite refinements over the original, mainly those having to do with convenience of operation, an improved system of control, greater capacity and a more artistic design of cabinet, but the original principles remain unchanged.

When it may be said that this machine, which revolutionized the art of radiography, has for over two decades retained the distinction of being the closest approach to perfection in apparatus for generating high voltage currents most suitable to the successful operation of X-ray tubes, it is eloquent proof that the principles of design were correct at their very inception.

The First Snook

Not long ago an effort to locate one of the first Snooks manufactured proved successful — the sixth, which is still working faithfully every day in the busy laboratory of a well known roentgenologist in Philadelphia, Pa. This particular machine adapts itself to present day technic, and its operator is producing

a quality of technical work that ranks with the higher standards in present day radiography. To quote from a letter from the owner of this machine: "In reply to your inquiry regarding the 1907 model Snook machine which we are using daily for routine work, we have averaged not over $10.00 a year for repairs. We have added auto-transformer control, Victor-Kearsley Stabilizer and have changed the switchboard, but the original transformer and rectifying switch are still in the machine."

From the standpoint of low cost of maintenance the above outfit is by no means an exception to the rule, for the records of performance prove to Snook owners everywhere an actual economy in the long run, aside from the other important advantages realized. Not long ago a questionnaire was submitted covering 150 Victor Snook machines that had been installed ten years ago, and it was interesting to learn from the 132 questionnaires returned not only that all of these are still in actual use, but of the general satisfaction expressed by the owners, one of whom stated "If others have had as little trouble with their X-ray transformers as I have had in ten years, they must be Snook users."

Thousands of Snook X-ray machines have been installed in hospitals and laboratories of X-ray specialists not only in the United States and Canada, but throughout the world. It is a fact that wherever civilization has extended itself, even into the most remote parts of the world, the Snook machine is known. It is in these far-off places that the Snook is especially appreciated, because of its consistent performance under the hardest use and unusual conditions, where expert service is not quickly available should trouble develop.

Invariably this host of world wide users attest to the statement:

"There is only one Snook"

The Snook 140 Kv. P.—Diagnostic

The Snook 140 Kv.P. apparatus, with its cross-arm type rectifying switch, in combination with a flexible, simple and effective control, represents the ideal in X-ray apparatus of this type for diagnostic service, radiography and fluoroscopy, and for light therapy. In all around efficiency it stands supreme, is equal to the most exacting demands of modern X-ray technic, and is in anticipation of future developments in the X-ray art.

Snook Rectifying Switch

The simplest definition of the famous Snook cross-arm type of rectifying switch is: consists of four insulated arms, revolving between pairs of oppositely opposed arcs, thus permitting rectification of the high tension alternating current, without danger of breakdown or short circuiting. This has proved to be the most perfect and efficient method of rectification for X-ray apparatus.

Comparing the two types of mechanical rectifiers in common use—the cross-arm type and the disc type or modifications of the latter—while X-rays are derived from the tube with both types of rectification, the four-arm cross-arm type is, however, the more satisfactory of the two. From the fact that the longer arc of the stationary shoes in the Snook rectifier permits the utilization of a considerably greater portion of each current wave than with any other mechanical rectifying device, it follows that for any given exposure time or number of cycles, current is flowing for a greater percentage of this period. This means that for a given milliamperage, kilovoltage peak and exposure time, the energy delivered to the X-ray tube is greater and more uniform than with any other type of mechanical rectifier. In order to obtain the same average milliamperage with disc type rectification, a greater current peak in each cycle is necessary, to compensate for the shorter percentage of time of actual current flow. This more uniform flow of energy, with its avoidance of extremes, obviously is easier on the tube. It is analogous with the use of any other mechanical or electrical device, to avoid stress is to insure a longer life of usefulness at maximal efficiency.

In order to explain clearly the operation of the rectifier, reference is made to the accompanying diagram. The four cross-arms are mounted on an insulating shaft and revolved by a synchronous motor especially designed for the purpose, and so constructed that it turns the shaft one-half revolution per cycle. Collecting shoes of opposite polarity are amply insulated with glass barriers, thus reducing the space occupied by the rectifier to a minimum. On the lower side of the switch two adjacent shoes, D and E, are connected to one high tension terminal of the transformer; the other two adjacent shoes, A and H, are connected to the other high tension terminal of the transformer. On the upper side of the switch, the two outside shoes, C and G, are connected together and thence to one side of the tube, and

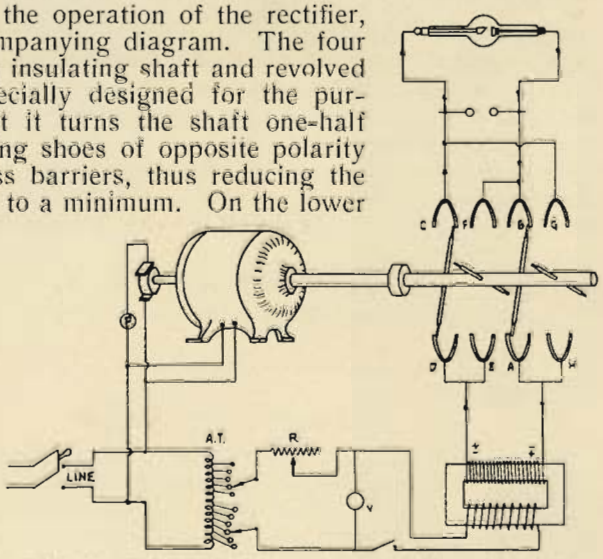


Fig. 1. Schematic Diagram of Rectifying Switch.

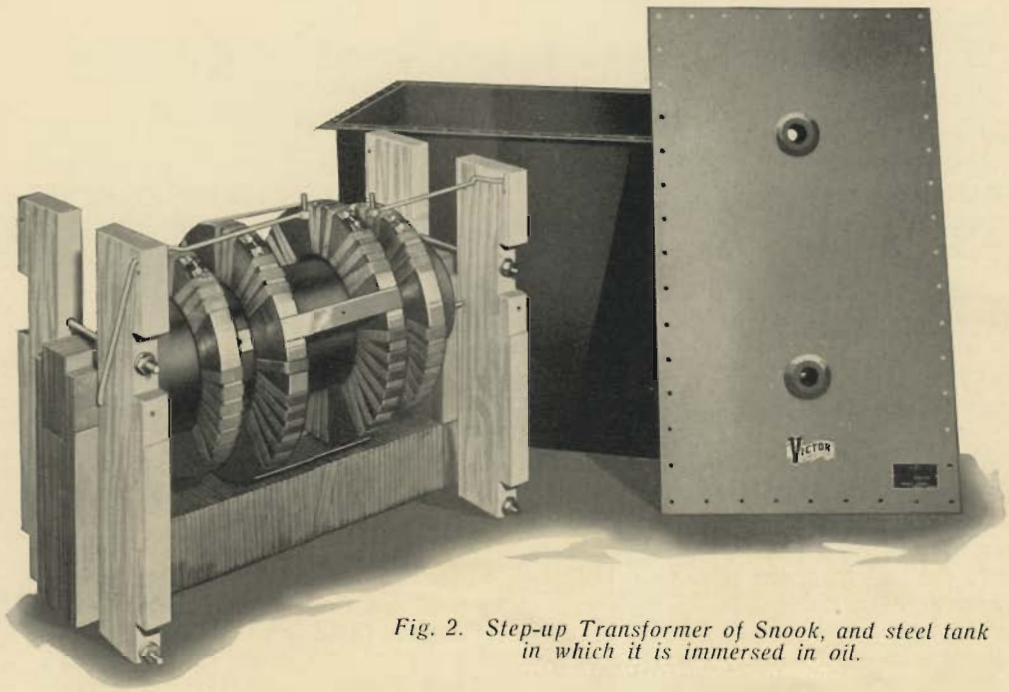


Fig. 2. Step-up Transformer of Snook, and steel tank in which it is immersed in oil.

the two inside shoes, F and B, to the other side of the tube.

Now consider the instant, as depicted in the diagram, when the left hand terminal of the transformer is positive and the right hand terminal is negative. At this instant the cross arms are in such a position that connection is made between shoes C to D and B to A, and the connection between shoes F to D and G to H is broken. At this instant the current may be said to flow from the left hand or positive terminal through shoes D and C to the anode of the tube, thence through the tube, and back through the shoes B and A to the right hand high tension terminal.

One-half cycle later the polarity of the high tension transformer will have reversed so that the left hand side is negative and the right hand side is positive. During this time the rectifying switch will have turned one-quarter of a revolution so that the connection between shoes C and D and between shoes B and A is broken, and a connection established between shoes F and E and shoes G and H.

Now the current flows from the right hand or positive terminal of the transformer through H to G and thence to the anode of the tube, then through the tube and back to the left hand or negative terminal of the transformer through F and E.

Thus regardless of the polarity of the high tension transformer the current will always flow through the tube in the same direction.

The Transformer

The design of the main step-up transformer used in the Snook apparatus represents the knowledge and experience gained over a period of many years. The importance of correct operating characteristics in the transformer cannot be over-stressed, as satisfactory operation of the rectifying device may be

Fig. 3. The Snook with Operator's Control Stand.

seriously hindered with a transformer that is incommensurate with the efficiency of the rectifier.

For this reason the step-up transformer used with the Snook was specially designed for X-ray purposes exclusively, as the commercial type of transformers do not meet the exacting requirements. In other words, there has been no compromise, but each component part is ingeniously designed for its important function in relation to the whole.

This step-up transformer is of the closed core type, oil immersed. The possibility of break down is virtually nil. An accurate record maintained in this respect shows that during the past six years only seventeen Snook step-up transformers have been returned to the factory for repairs of any kind. This record of reliable and consistent performance is possible only by correct design, the selection of proper materials, skilled workmanship and adequate facilities for manufacture in every detail.

Simplified Auto-Transformer Control

The uniformity of voltage increases between steps of control of the Snook transformer proper is obtained through a specially designed auto-transformer control, which in this instance is a single lever control instead of double, a decided advantage from the standpoint of safety and simplicity in operation.

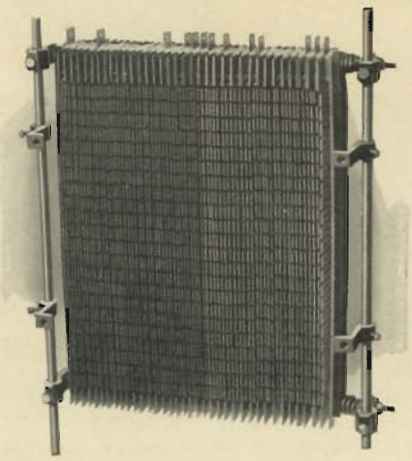


Fig. 4. One Unit of Grid Rheostat.

Grid Type Rheostat

Although the rheostat as a control is used only to a very limited extent in radiography, since the advent of the auto-transformer control, it is still considered a standard part of every equipment, to obtain intermediate values of primary voltage between auto-transformer buttons, in exceptional cases; its principal use, however, is in connection with the therapeutic application of X-rays. The grid type rheostat, instead of the various forms of wire coil resistances, has a number of advantages, in that it dissipates the heat more rapidly, consequently permits longer operation with considerably less voltage drop; is not fragile; and its unit construction simplifies installation and maintenance.

As with the auto-transformer control, regulation of the rheostat is also through a single lever control, affording added safety to the operator and simplified operation.

Control Stand Combines Safety and Convenience

As shown in the illustration, the operator's control stand is a separate unit, mounted on casters for convenience in moving into the most advantageous operating position according to the work in hand.

The operating switches and control levers of the control stand are so designed that there are no live external circuits with which the operator can come in contact in manipulating these controls. The operating handles are of con-

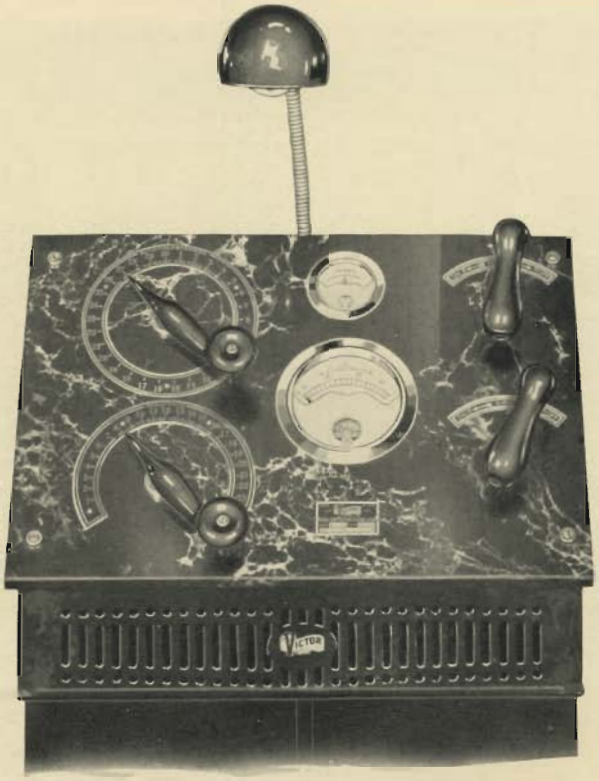


Fig. 5. The Control Panel.

venient size and shape, the main line switch as well as the operating switch being of the wrist-motion quick break type. The pre-reading voltmeter is a standard part of the control stand, and is so connected that the primary voltage may be read before the X-ray switch is closed. Thus with the machine calibrated, i.e., readings of this meter recorded for the milliamperages and kilovoltages obtained throughout the range of the machine, one may readily predetermine the exact kilovoltage that will be delivered to the tube at any setting of the auto-transformer control, without having to close the X-ray switch. This is the most practical and satisfactory method for duplicating results, which leads to standardized technic.

The *plate glass protective screen* as seen in the illustration of the control stand, is additional to the protection afforded by the lead glass bowl surrounding the X-ray tube, and primarily for the protection of the operator against secondary radiations. This plate glass is half an inch thick, of the clearest glass obtainable, to give the operator unobstructed vision. The lower part of the two wings holding this plate glass is of metal, likewise offering similar protection.

From the fact that so many installations of the present provide a special control booth for the operator, this plate glass screen is not a standard part of the equipment, and therefore is listed separately.

Flexibility of Control and Its Importance to the End Result

The most satisfactory radiographic results in the busy laboratory making routine examinations of a large number of patients, involving every part

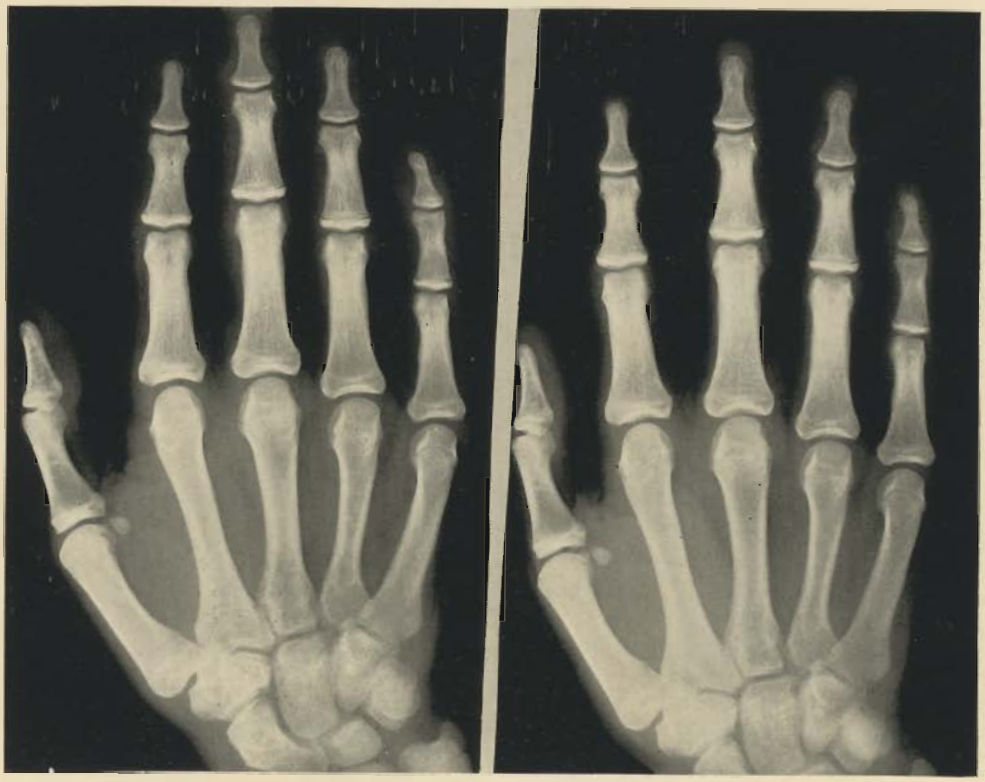


Fig. 6. Demonstration of Uniform Power Delivery with the Snook.

The above halftone is a reproduction of an 8x10 film, without retouching. The factors used in these two exposures were as follows:

Left: 10 Ma. at 60 Kv.P., 36" distance for 10 seconds.
Right: 100 Ma. at 60 Kv.P., 36" distance for 1 second.

Both exposures being on the one film, the developing process was obviously the same throughout. Note that the density is practically the same in both, proving that uniform power delivery applies not within a selected range but over the complete range of the Snook.

of the body, will obviously depend not only on a sufficient amount of equipment, but flexibility of that equipment as well. This applies particularly to the X-ray machine itself, the heart of the equipment, and in the Snook machine the operator has every conceivable advantage from the standpoint of flexibility of control. Given a reliable mechanical rectifier and an equally reliable transformer, the maximal in radiographic results must obviously depend on both the possibility and means of control.

The ideal in control of an X-ray machine is known as *uniform power delivery*, which is fully realized in operating the Snook. When it may be said that with the Snook any milliampere-seconds value may be used over its entire range, by keeping kilovoltage constant and varying the time inversely as the change in milliamperage, and still realize a uniform radiographic density, it offers another distinct reason why the operator of a Snook machine realizes very definite advantages—why he never need be at loss to determine the correct technical procedure for an unusual case. Attention is called to Figure 6 as a practical explanation of uniform power delivery.

With the auto-transformer a complete range of uniform voltage regulation is available, from the minimum to the maximum output of the apparatus, through its 30 buttons or steps. With the resistance control is likewise available an additional regulation of the primary voltage, through 23 buttons or

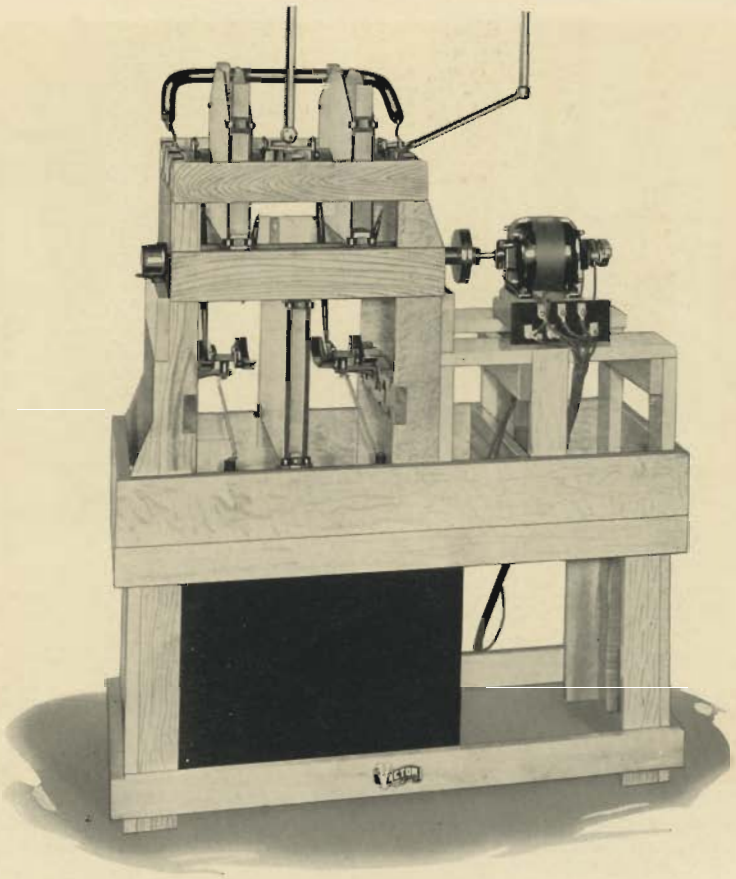


Fig. 7. Showing the Snook without cabinet, and mounted on the special supporting frame as used when the machine is remotely installed in a separate booth.

steps, over the entire range of the machine. Although either of these controls may be operated independent of the other, their design permits their use co-ordinately, thus giving the operator many additional points of adjustment and refined control.

Cabinet

The cabinet is of dark quarter sawed oak, beautifully finished, and from the standpoint of appearance makes a desirable addition to the perfectly appointed laboratory.

In instances where the transformer is remotely installed in a special booth or closet the cabinet is usually dispensed with; a special supporting frame is used in such instances, with fittings for connecting to the overhead system.

Dimensions and Shipping Weights

	With Cabinet		*Without Cabinet*	
	A. C.	D. C.	A. C.	D. C.
Height over all	70 in.	70 in.	57½ in.	57½ in.
Length over all	51½ in.	68 in.	45¾ in.	61½ in.
Width over all	27½ in.	27½ in.	22¼ in.	22¼ in.

Fig. 8. Two views in the Victor tube department, where every Coolidge tube sold in the United States is manufactured. Standard Victor equipment is used in the exhausting and testing of the tubes, operating nine hours a day, running at more than their rated capacities and subjected to abnormal strains. A Snook machine shows a record of ten years constant service in this department, and still in operable condition. It may be considered the supreme test.

Control stand (with plate glass screen) 78 in. high x 38 in. long x 20 in. wide.
Control stand (less plate glass screen) 59 in. high x 22 in. long x 20 in. wide.

A. C. Apparatus with cabinet	1625 pounds	Approximate Shipping Weights
A. C. Apparatus without cabinet	1275 pounds	
D. C. Apparatus with cabinet	1875 pounds	
D. C. Apparatus without cabinet	1525 pounds	

Specifications

Code	Cat. No.	
Palma	V2348	Model Snook 140 Kv.P. X-Ray Apparatus, in oak cabinet, arranged for 220 volt, 60 cycle, alternating current, complete with resistance control, auto-transformer control, polarity indicator, prereading voltmeter, shaded lamp switchboard illuminator, 13 feet of cable for connecting machine with remote control stand and 10 feet of flexible line cable. Not including milliamperemeter.
Pare	V2350	Same as above but arranged for 220 volt, 25 cycle, Alternating Current.
Pardi	V2347	Arranged for 220 volt, Direct Current, including same accessory equipment as listed under V2348 but omitting polarity indicator.
Paw	V2370	Arranged for 110 volts, 60 cycle, Alternating Current, including same accessory equipment as listed under V2348.
Pawt	V2372	Arranged for 110 volt, 25 cycle, Alternating Current, including same accessory equipment as V2348.
Past	V2358	Arranged for 110 volt, Direct Current, including same accessory equipment as listed under V2348, but omitting polarity indicator.
Pax	V2373	Arranged for 500 volt, Direct Current, including same accessory equipment as listed under V2348, but omitting polarity indicator.
Carom	V2049	Glass protective screen only for mounting on remote control stand of Model Snook.

Note: Each of the above listings is inclusive of oak cabinet. When the apparatus is desired without cabinet, for remote installation, this should be specified, and the apparatus will be furnished on a special supporting frame for the rectifying switch, with the necessary fittings for connecting to the overhead system.

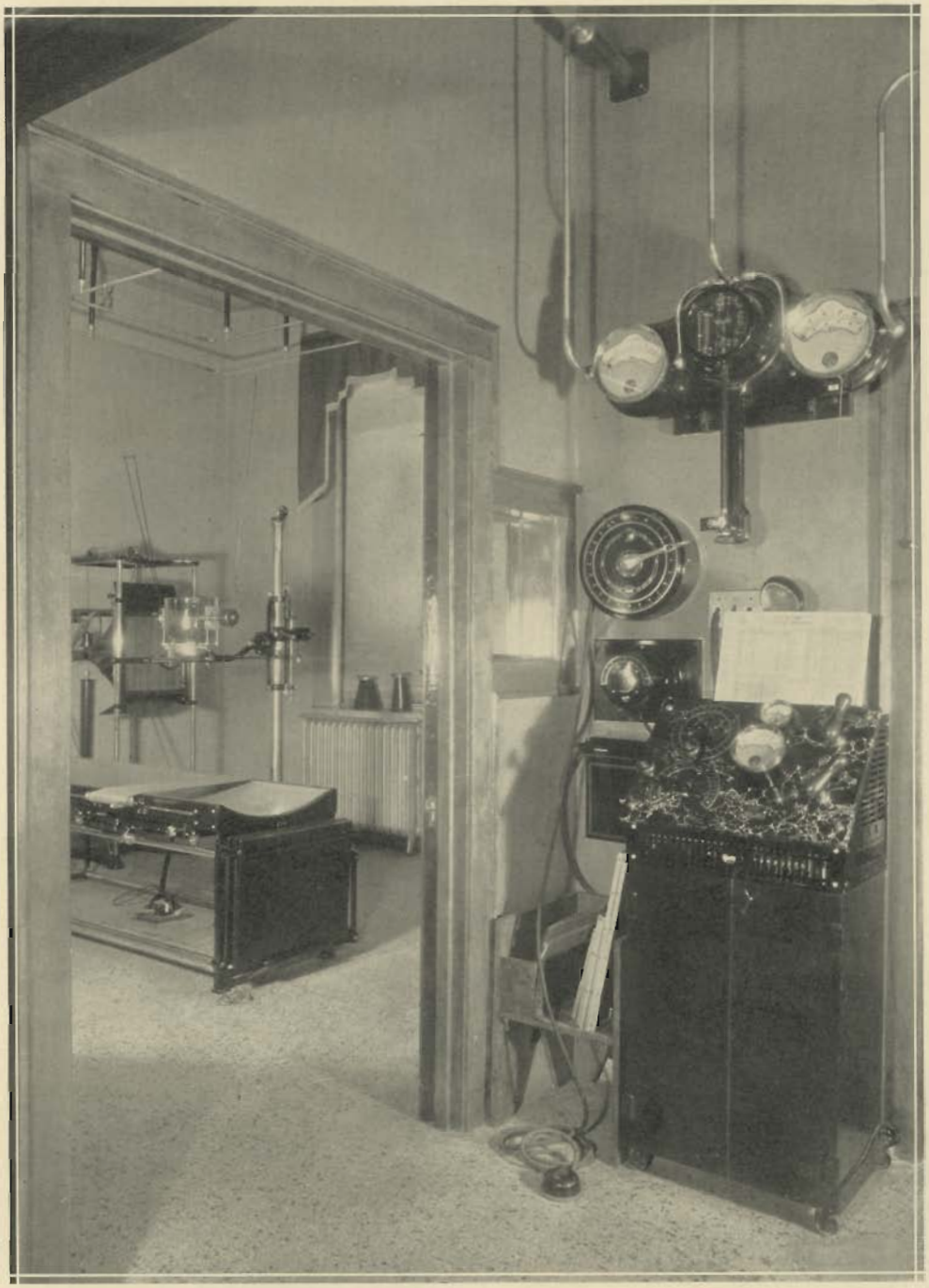


Fig. 9. This installation has the operator's control booth just off the radiographic room. The Snook machine is in a separate room immediately in back of the operator's control booth.

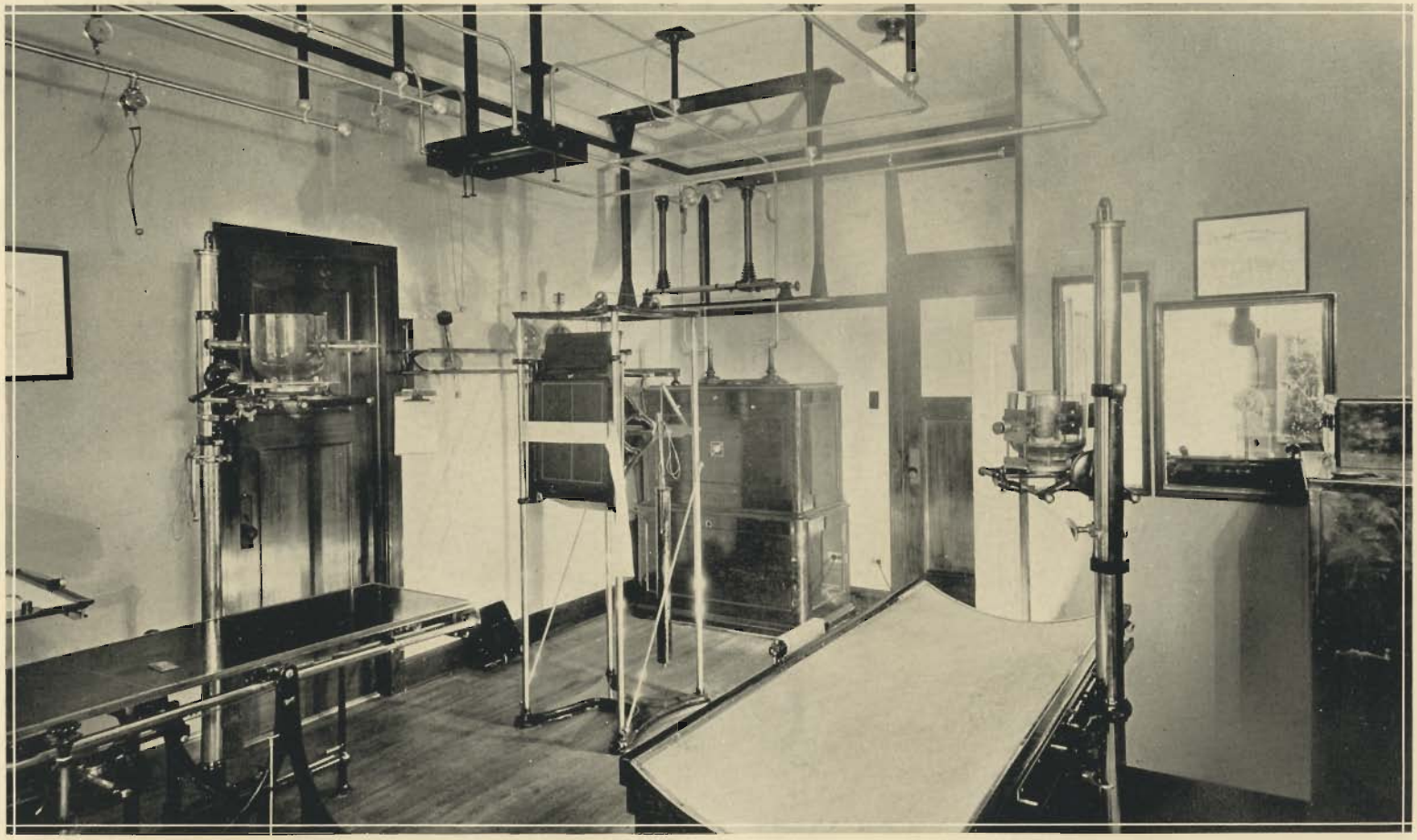


Fig. 10. In this installation the Snook in its cabinet is located right in the X-ray room. The operator's remote control booth (lead lined) is on the right, with lead glass windows affording a view of any part of the room.

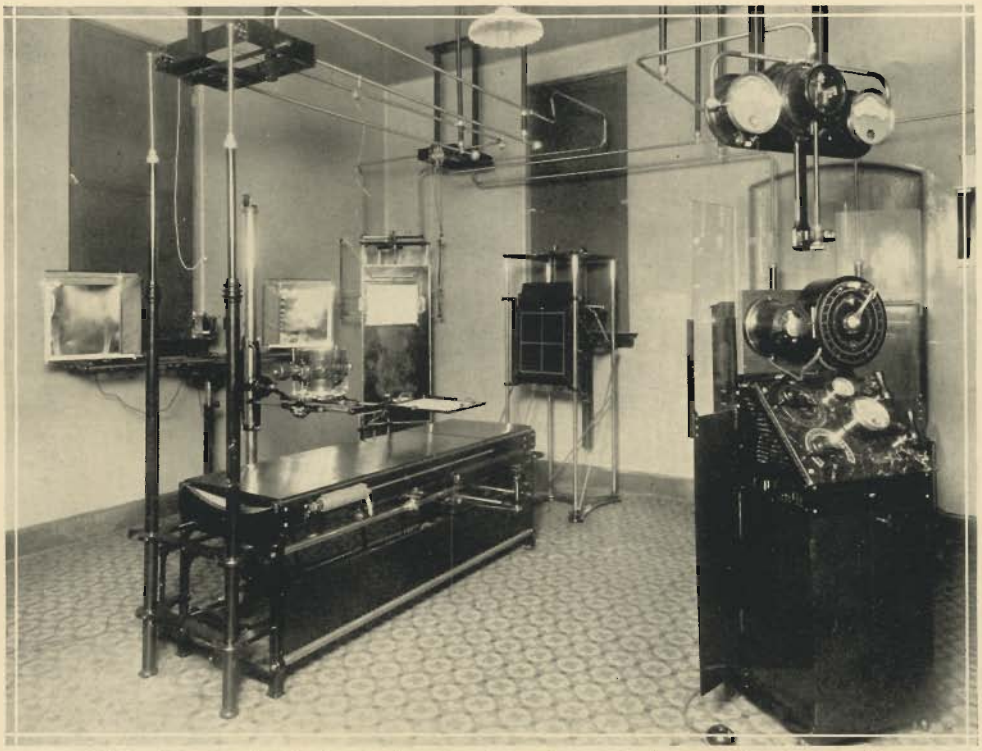


Fig. 11. In this instance the Snook and operator's control stand both are installed in the radiographic room.

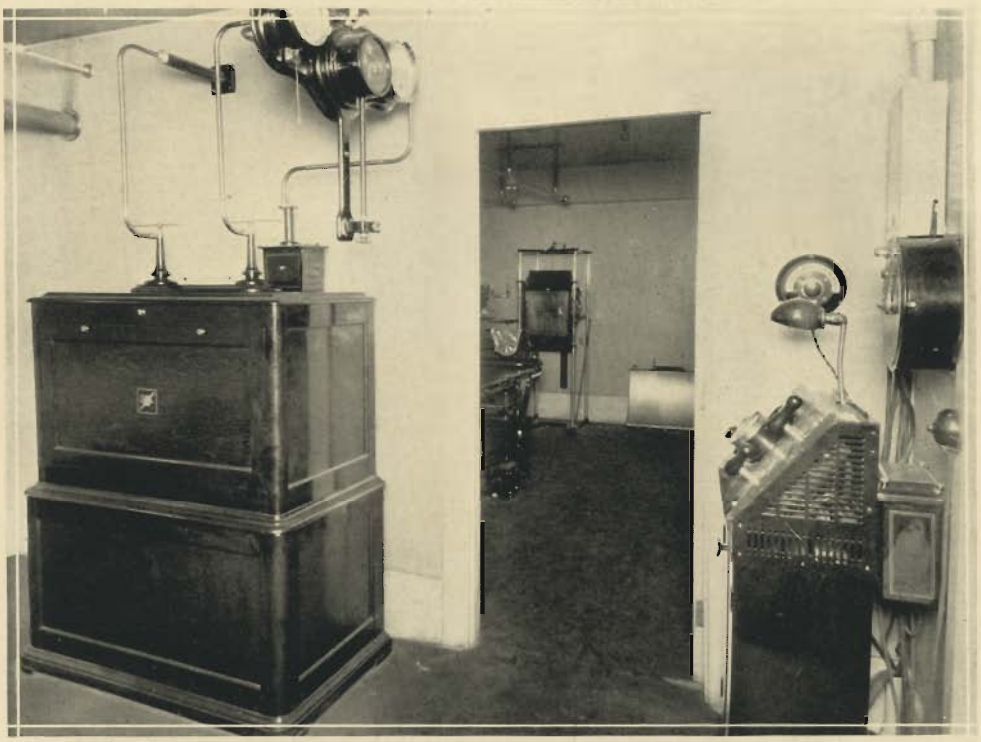
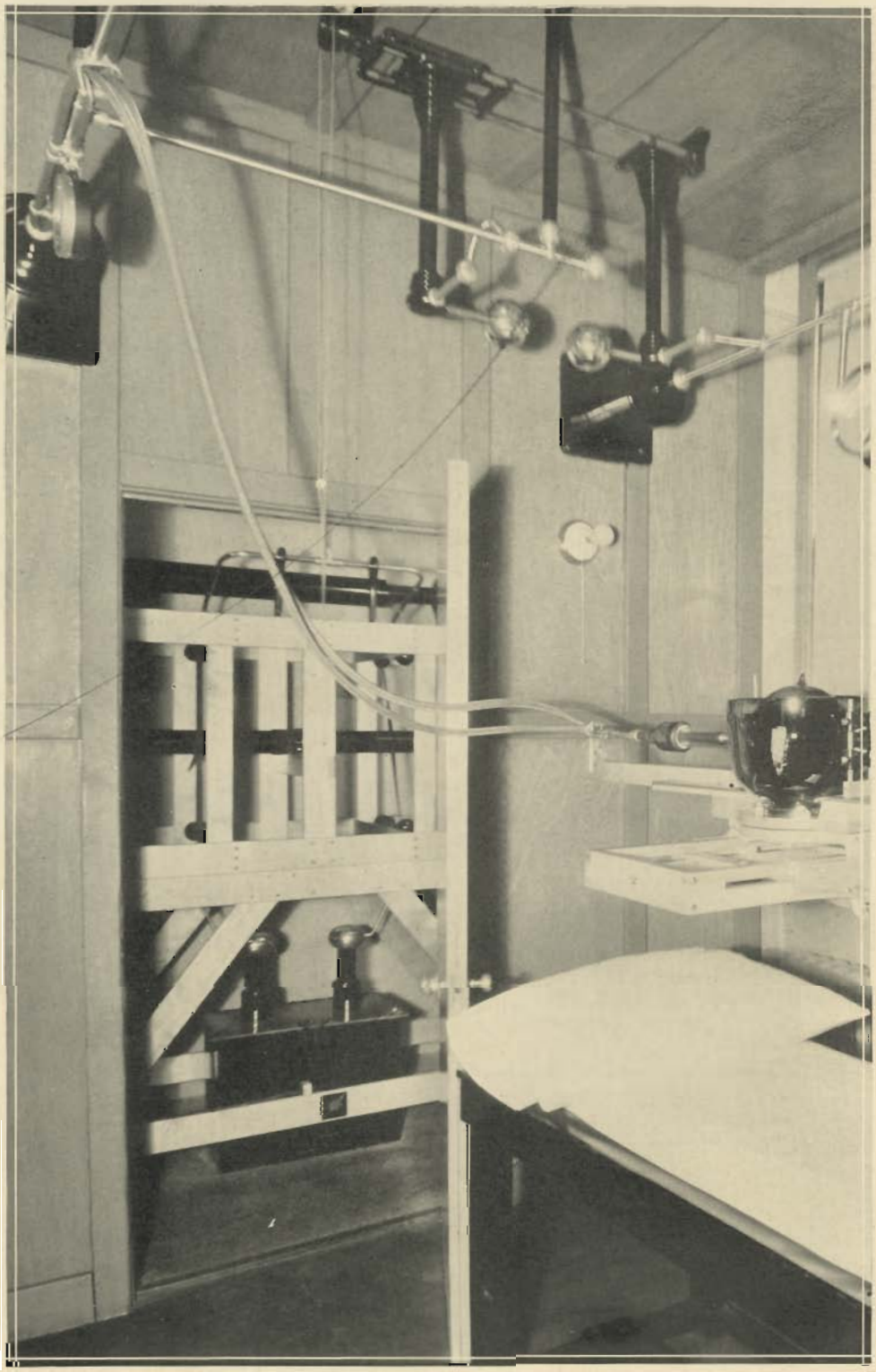


Fig. 12. Here both the Snook and control stand are in the same room, remote from the radiographic room.



The Snook 200 Kv. P.
Combination Deep Therapy-Diagnostic Apparatus

Since the advent of the 200 Kv.P. Coolidge tube in 1921, the General Electric X-Ray Corporation has devoted considerable attention to the development of apparatus for use primarily in deep X-ray therapy. As this type, in fact all types of Coolidge tubes sold in the United States, are manufactured in our plant in Chicago, it is reasonable to expect that Victor engineers, with an intimate knowledge of the requirements and limitations of every type of Coolidge tube, are in an ideal position to determine the correct design for apparatus with which to energize the tube to its maximal efficiency.

With this obvious advantage, together with years of experience and observation of outfits in actual operation everywhere, under every conceivable variation of conditions, the conclusion has been reached, and very definitely, that the Snook type of rectification is far the most practical and satisfactory for the operation of the deep therapy tubes, both air-cooled and water-cooled types.

For this reason the 200 Kv.P. Snook apparatus was designed for deep therapy purposes, there being no deviation from the Snook principles already described in the fore part of this bulletin, the only essential difference being an increase in the capacity, and an increase in size accordingly.

Because the Snook had been long established as an ideal radiographic machine, and since the original principles remain the same in the 200 Kv.P. model, the result is a design which very happily offers a combination outfit for both deep therapy and diagnostic service. Many institutions have found it to meet their needs ideally, especially from the standpoint of economy, when funds have not been available for separate X-ray outfits, for deep therapy and diagnostic service respectively. Again, it has met the problem of limited floor space in many institutions, where two separate outfits could not be accommodated to practical advantage.

First Requisites for a Deep Therapy Machine

The accurate measurement of X-ray dosage is unquestionably of first importance in all deep therapy work. Unless this factor can be accurately controlled and measured the treatment is little better than guess work, and the possible consequences all too serious.

It follows then, that unless there is consistent operation of the tube, accurate measurement of dosage is impossible. Thus it resolves itself to the very definite requirement that the current must be delivered to the tube in proper form. First, the voltage produced must be at a uniform peak, for the quality or penetration of the X-ray is in proportion to the highest voltage reached in each cycle. Unless this same peak is reached in *each and every cycle* there can not be uniformity of penetration, and a constant variation is a hindrance to accurate measurement of dosage.

To realize this essentially uniform peak voltage we may rely on the Snook method of rectification with the cross-arm type of mechanical rectifier. In no instance has the "Snook" rectifier meant more than when applied to the extremely high voltages used in deep therapy. Conclusive proof of this lies in the fact that the Snook type deep therapy apparatus has met these most critical requirements in the laboratories of radiologists in all parts of the world since 1921.

Extreme Humidity or High Altitude No Barriers to Satisfactory Operation

There is no little significance in the preceding statement, considering the extreme humidities and high altitudes involved in a world wide list of users. Radiologists who have had to operate machines under either of these extreme conditions know very well the difficulties encountered. The Snook has proved eminently satisfactory in all climates and altitudes, and not a few radiologists whose geographical locations have contributed to annoying machine troubles, have ultimately turned to the Snook as the logical solution.

Importance of the Victor-Kearsley Stabilizer

Milliamperage is still another vitally important factor in the measurement of X-ray dosage. If the milliamperage passing through the tube is held constant throughout the treatment period, it obviously helps considerably in the accurate measurement of dosage. But, unfortunately, most electric supply lines are subject to fluctuations which, even though of little consequence in the operation of ordinary electrical equipment, are serious barriers to the satisfactory operation of any X-ray apparatus unless these fluctuations can be compensated for. Actual tests show that a seemingly negligible change in current to the Coolidge filament causes a considerable change in tube current. But here, too, Victor equipment is fortified against such contingencies, by the interposition of the Victor-Kearsley Stabilizer in the high tension circuit, its function being to hold the milliamperage constant regardless of fluctuations in the line supply and regardless of tube characteristics.

Fig. 13. Victor-Kearsley Stabilizer.

It is important to here mention that the Victor-Kearsley Stabilizer should not be confused with so-called stabilizers (constant potential transformers) which are designed solely for regulating the current to the filament side of the tube, and irrespective of the changes which take place within the tube itself due to its operating characteristics. In other words, even though the filament current is held constant, there are changes in the milliamperage flow due to these very tube characteristics.

The following is quoted from an article by W. S. Kearsley, Jr., of the Research Laboratories of General Electric Company, in describing his invention before a meeting of the Radiological Society of North America: "The stabilizer is operated directly by the high tension current which flows through the X-ray tube. Any change in this high tension current causes the stabilizer to act directly on the current flowing through the filament. If for any reason the high tension current through the tube tends to drop, the stabilizer immediately increases the filament current sufficiently to prevent the drop. The same holds true for a rise in high ten-

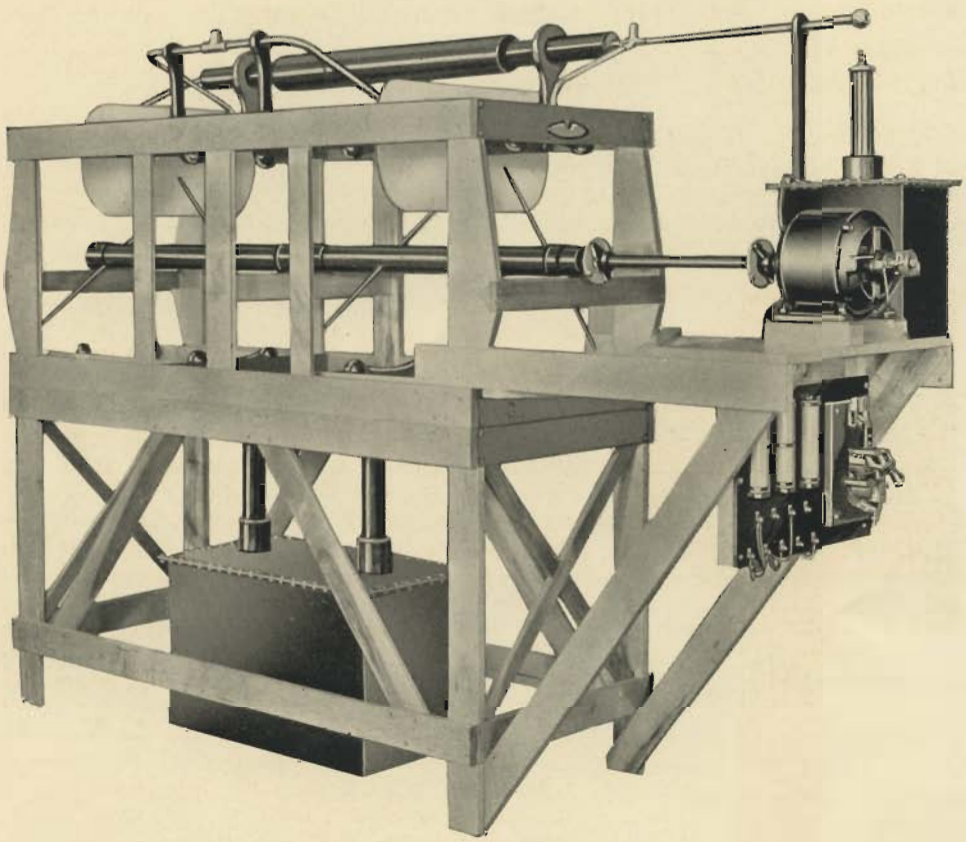


Fig. 14. Showing the 200 Kv.P. Snook without cabinet, as furnished for remote installation in a special booth. The illustration on page 25 shows the machine in a glass panelled cabinet, as furnished when the installation is not remote.

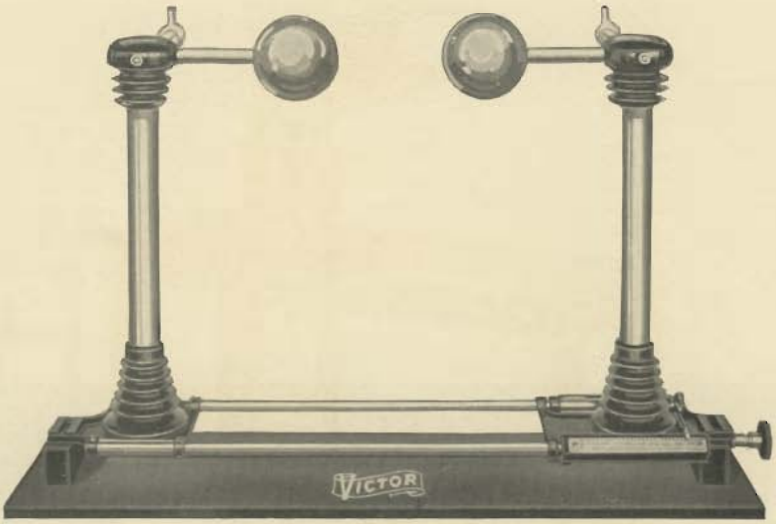


Fig. 15. Victor Sphere Gap.

sion current, the filament current in this case is immediately lowered enough to keep the milliamperage at the desired value."

Double Check on Milliamperage—Voltage Readings by Sphere Gap Method

In all Victor installations for deep therapy it is standard practice to place two milliammeters in the circuit, so that a double check on tube milliamperage is possible at all times.

For the reading of voltages, the point gap method has long been discarded with Victor installations, and the sphere gap method used exclusively. The sphere gap is the only device recognized by the American Institute of Electrical Engineers as sufficiently accurate for practical measurement of voltages exceeding 50,000. The Victor sphere gap is designed according to the specifications laid down by the Institute. Every care has been used in its construction, mindful of the fact that the slightest deviations from the standard laid down will seriously impair the accuracy of dosage measurements.

Deep Therapy Table

As may be seen in Fig. 16 the deep therapy table is built of wood, specially selected and well seasoned, and the construction very substantial throughout. The overall dimensions are 75 inches long, 37 inches wide and 56 inches high.

The tube stand has a travel of 44 inches lengthwise the table, this movement free and easy due to the four ball-bearing wheels along the tracks.

The tube holder has a travel of 10½ inches cross-wise the table, and allows a total 180° tube tilt, i.e., 90° each side the vertical, lengthwise the table. A

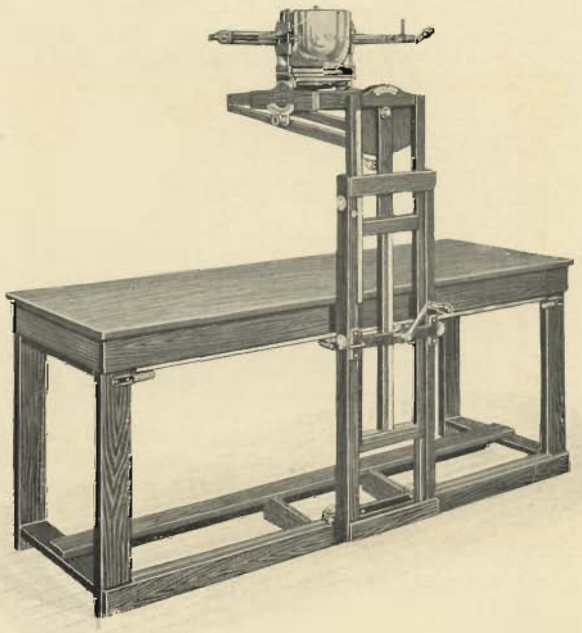


Fig. 16. Rear View of Therapy Table, Showing Adjustments.

40° tube tilt is also possible, or 20° each side the vertical, crosswise the table. Calibrated scales are provided for all these tube tilts.

A rack and pinion arrangement permits the tube holder also to be raised or lowered over a range of 22 inches. With the tube at lowest position the distance from the tube target to the table top is 20 inches; the maximum distance is 42 inches.

Complete rotation of the tube is possible through the swivel mounting of the lead glass bowl. A special rack is provided for holding filters. A lock clamp serves to secure any desired position of the tube stand.

Overhead System

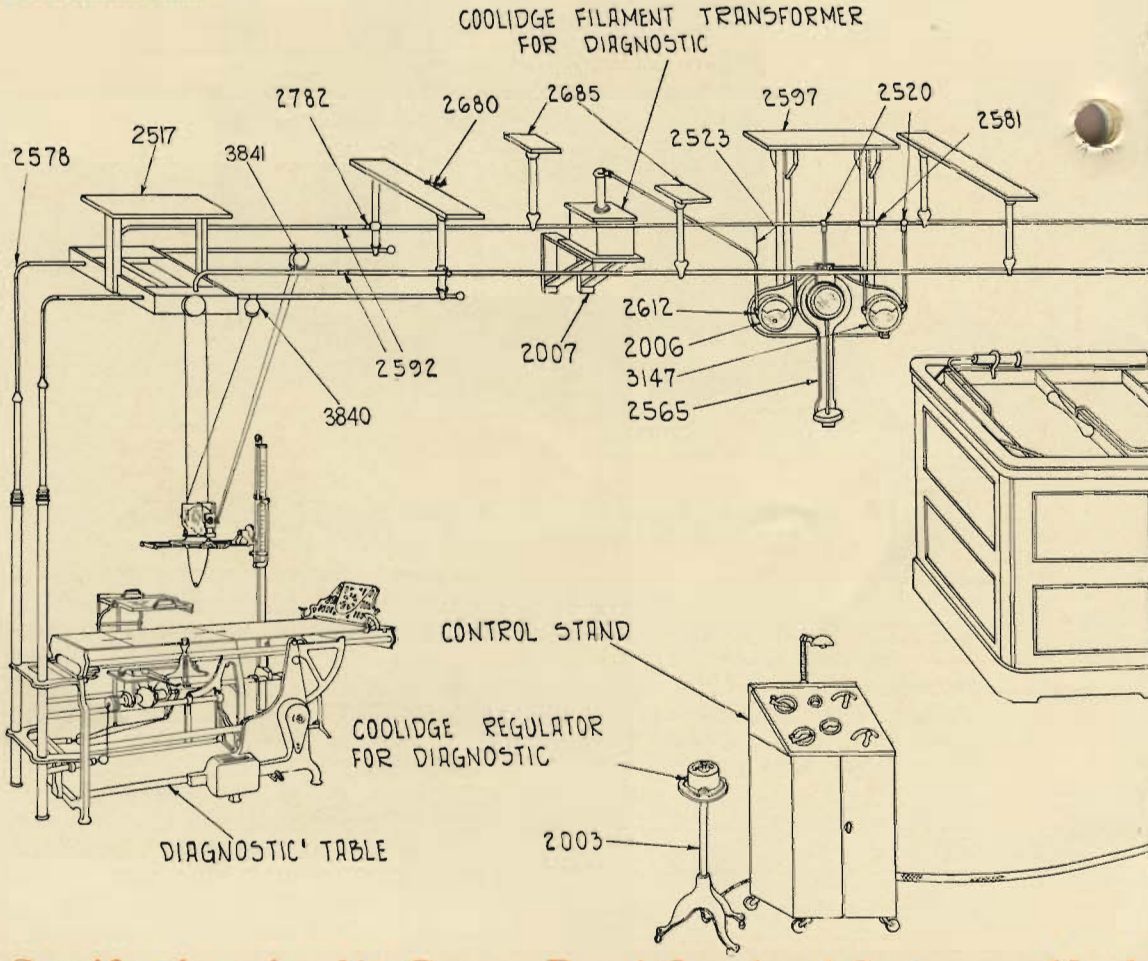
The standard Victor Corona-Proof Tubular Overhead System is used with this apparatus, using a tubing of ¾″ diameter. This is a very flexible system, adapting itself readily to every need and variation in installation. It is fully corona-proof, to eliminate entirely the objectionable nitrous oxide from the X-ray room (of special importance in the small and poorly ventilated room), also to insure complete darkness in the fluoroscopic room.

Whether the installation is for deep therapy only or for a combination deep therapy and diagnostic service, this overhead system is universal in application. The diagram on pages 22 and 23 will give a comprehensive idea of how a plan for installation may be worked out to advantage.

The illustration (Fig. 17) shows the wall insulator as used in deep therapy installations when the Snook is located in a room adjoining that in which the treatment table is located. The materials used are of the highest insulating properties, to offer a safe conduit for the high voltage, without leakage. The cap at each end makes the conduit practically soundproof. It is the most effi-

This schematic diagram shows in detail the various parts of the Victor Corona-Proof Tubular Overhead System, as they apply to a 200 Kv.P. Snook installation for combined therapeutic and diagnos-

Diagnostic Side



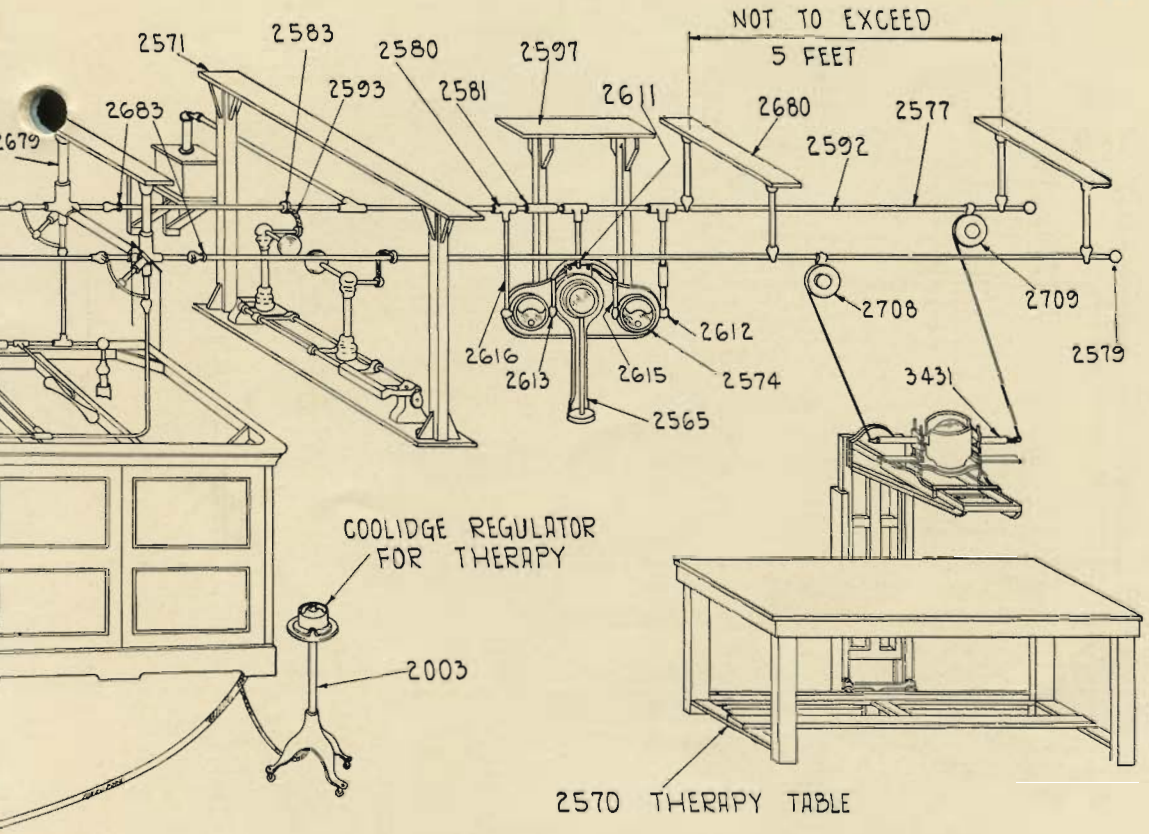
Specifications for ¾" Corona-Proof Overhead System as Used

Code	Cat. No.	
Techy	V2517	*Corona-Proof High Tension Switch, for directing current to either of the two tubes (radiographic and fluoroscopic) on the diagnostic table; designed for diagnostic installations only.
Yezzo	V2899	Shaft Extension Unit for V2517 Switch.
Yatla	V2679	*Corona-Proof High Tension Overhead Switch; designed for both diagnostic and therapeutic installations.
Yauat	V2691	*Adapter, right angle, (where V2578 is too long).
Yahtb	V2578	*Elbow.
Yatmo	V2680	*Insulating post (double).
Yaucy	V2685	*Insulating post (single).
Yehad	V2782	*Tubing Support for two-way overhead system.
Yahez	V2577	*Tubing, ¾" diameter.
Yajeb	V2592	*Coupling.
Yahya	V2581	*Aerial insulator.
Yahoc	V2579	*Terminal Ball.
Yatry	V2683	*Adapter for tubing to High Tension switch.
Yajic	V2593	*Spring connection.
Yaibt	V2583	*Adapter for connection of Sphere Gap to tubing.
Yahud	V2580	*"T" Connector.
Zivit	A3840	*Anode Reel for diagnostic side.
Yawyt	V2708	*Anode Reel, for therapy side (9 ft. of cable).
Zivar	A3841	*Cathode Reel for diagnostic side.
Yayap	V2709	*Cathode Reel, for therapy side (9 ft. of cable), includes cathode terminal A3311.
Yegyj	V2781	Reel Adapter, for attaching cord reels to overhead.

*Items marked with asterisk are shown in position in the above diagram.

tic service. An overhead system so practical, efficient and flexible simplifies the work of the operator in his control of both the therapeutic and diagnostic sides of the equipment.

Therapy Side



for a Combination Diagnostic—Deep Therapy Installation

Code	Cat. No.	
Yaadt	V2523	*Wire for Filament Circuit.
Yajza	V2597	*Mounting board and bracket for Stabilizer and meters.
Yeibz	V2792	Mounting Board and Bracket for Meters.
Yalgo	V2611	*Lug for connecting tubing to Stabilizer.
Yalif	V2612	*Meter connection, spherical, short shank (2 required).
Yeifd	V2793	Meter connection, spherical, long shank (2 required).
Yaljy	V2613	*Meter connection, oval (2 required).
Yalog	V2614	*Elbow connector between meters and stabilizer.
Yaluh	V2615	*4¾" length of ¾" tubing.
Yange	V2630	*8⅜" length of ¾" tubing.
Yalyj	V2616	*10¼" length of ¾" tubing.
Yawep	V2701	Wall Bushing Insulator, set of 2 units.
Yawna	V2702	Ceiling Bushing Insulator, set of 2 units, (mention thickness of ceiling).
Yegjy	V2778	Partition Insulator—plain (2 required).
Yegog	V2779	Partition Insulator, with Wall Flanges and Caps (set of 2 units).
Yagwa	V2574	*Milliamperemeter, Type AII, 0 to 10, 9" diameter (2 required).
Yebbo	V2732	Milliamperemeter, Type AR, 0 to 60, 9" diameter (for Water-Cooled Coolidge Therapy Tube).
Axio	A3147	*Milliamperemeter, diam. 9" (O-20, O-200).
Axle	A3148	Milliamperemeter, diam. 7" (O-20, O-200). for remote control booth.
Yeguh	V2780	Milliamperemeter, 9" diam. (O-50, O-500).
Brew	V2006	*Coolidge Ammeter (9 inch diam.)
Breth	V2005	*Coolidge Ammeter (5 inch diam.)

*Items marked with asterisk are shown in position in the above diagram.

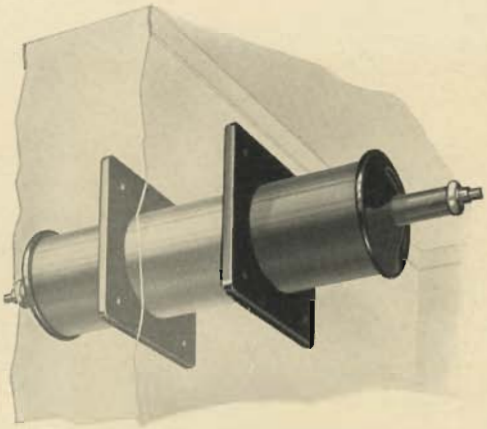


Fig. 17. Wall Insulator.

cient method of bringing the current through a wall, and at the same time is neat in appearance. This same insulator, with a minor change, is also used when the current is to be conducted through a ceiling.

Air-Cooled Deep Therapy Coolidge Tube

This tube is similar to the well known Universal Type tube, but is larger and is designed to operate continuously on rectified current at a voltage not exceeding 200 Kv.P. Max. at 5 Ma., also 8 Ma. continuously under forced cooling conditions. The bulb is 8 inches in diameter, the length of the tube approximately 34 inches.

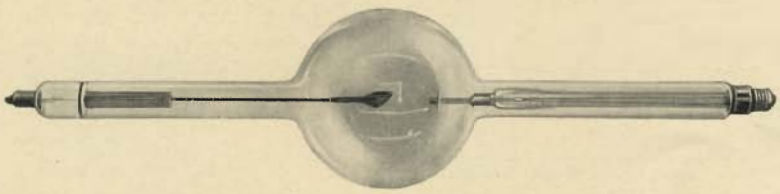


Fig. 18. The Air-Cooled Deep Therapy Coolidge Tube.

Water-Cooled Deep Therapy Coolidge Tube

Except for the anode construction and mounting, this tube is very similar in appearance to the air-cooled treatment tube and has similar characteristics. The anode is constructed to provide for the circulation of water immediately

Fig. 19. The Water-Cooled Deep Therapy Coolidge Tube.

behind the focal spot to remove the heat as rapidly as it is generated, thereby making it possible to use a much greater energy. The capacity of this tube is 30 Ma. at 200 Kv.P.

Water-Cooling System

In order to safeguard this tube, on which may be imposed an amount of energy heretofore considered impossible, and producing X-ray intensities never

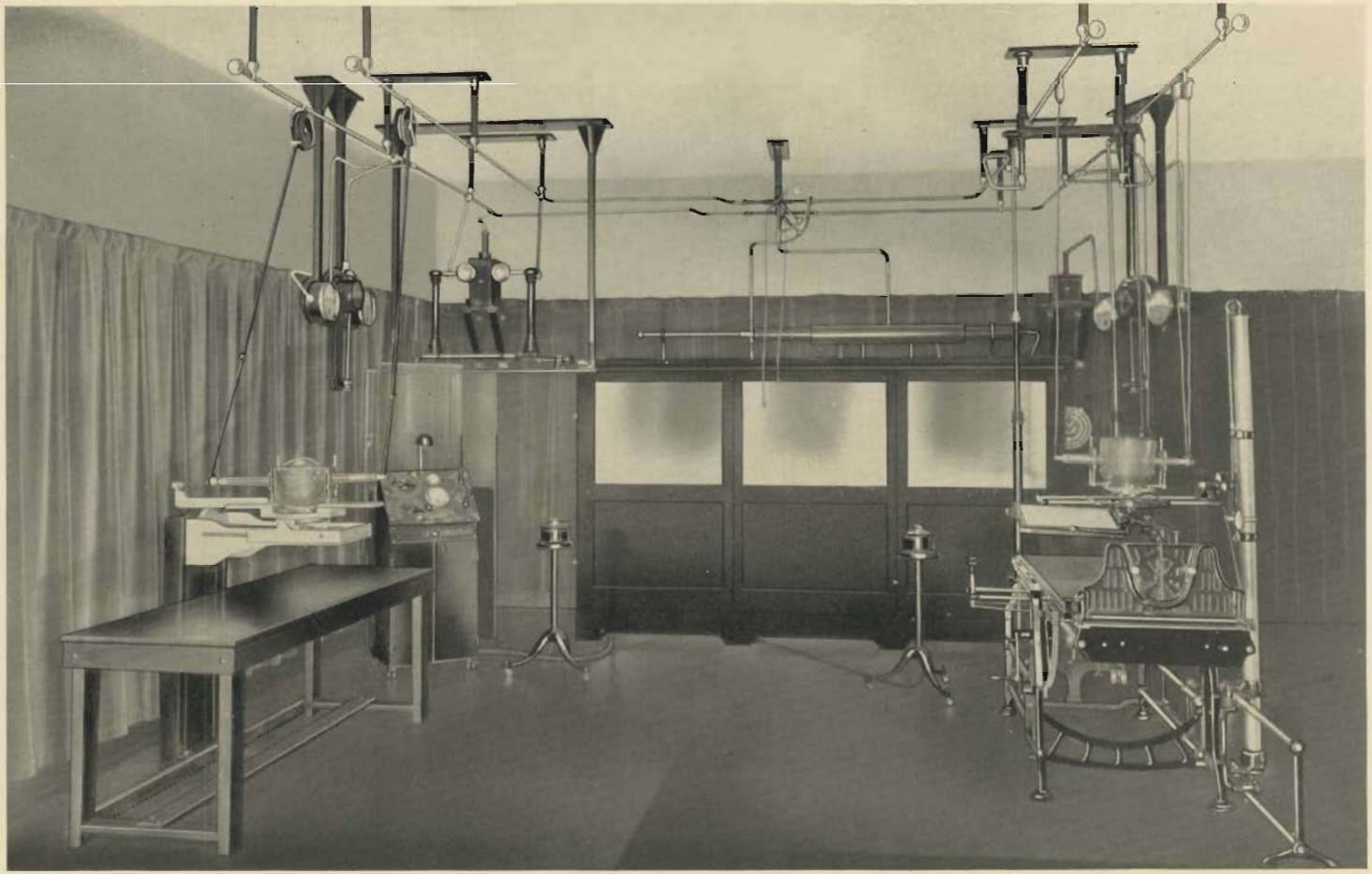


Fig. 20. Combining deep-therapy and diagnostic service with the Snook 200 Kv.P. This arrangement, as photographed in the Victor show-rooms at Chicago, is not submitted as the ideal, but rather as a practical and convenient means of showing the inter-relation of the major apparatus units and the overhead control system, from the standpoint of operator's control, independently, to either side of the equipment, therapeutic or diagnostic. Note that the Snook is in this instance housed in a glass-paneled cabinet, due to its position on the open floor. See also schematic diagram on pages 22 and 23.

before available for therapeutic use, the importance of correct design in the water-cooling system cannot be overemphasized.

What a Cooling System Must Do

To dissipate the heat resulting from the unusually high wattage within the tube, water must be forced through the tube and kept in constant circulation by means of a pressure pump which must maintain a pressure of from 45 to 60 pounds per square inch. So that the tube may operate continuously, this heated water must be subjected to a cooling process before it is again circulated through the tube. This is done by running the water through a radiator, which in turn is cooled by a suction fan which draws cold air, or air at room temperature, through the radiator. Thus the temperature of the water is lowered as it circulates through the radiator before it is again pumped through the X-ray tube.

Three Safety Devices for Tube Protection

Three safety devices have been provided in the Victor water cooling system, to guard against any possibility of non-circulation of water, or should it reach a predetermined excessive temperature. These are:

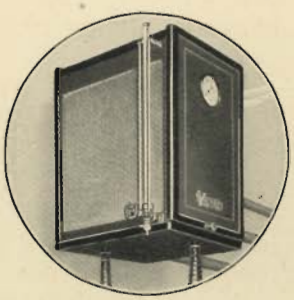
1. A glass tube water level indicator mounted on the radiator, and through which the height of the water in the radiator can be visually determined by the operator at all times.
2. A water pressure gauge installed in the circulating system, and indicates the water pressure through the X-ray tube, as it is essential that this pressure remain practically constant. The control of this pressure is by the closing or opening of a small valve situated in a by-pass.
3. A thermostat principle, consisting of a syphon tube enclosed in a metallic housing. The water is made to circulate around this thermostat, which reacts immediately to any change in the temperature of the water. The thermostat is connected electrically to a cut-out circuit breaker, this circuit breaker controlling all of the energy supplied to the X-ray apparatus proper. The thermostat being set to operate at a predetermined temperature, when this temperature is reached it expands and closes two contacts which in turn operate a shunt coil on the circuit breaker, thus causing the entire line supply to be cut off.

Circuit Breaker Between Line Supply, X-Ray Transformer and Cooling System

The entire water-cooling system is a complete unit, including the circuit connected to the control stand of the X-ray apparatus. In closing the circuit breaker the motor which operates the circulation pump and ventilating fan is immediately put into operation before any of the other apparatus can be operated. In this way it is assured that water is circulating through the X-ray tube before the X-ray switch is closed.

Thoroughly Insulated

The highly important factor of insulation has also been given special attention in designing this apparatus. For instance, the radiator, pump and fan being a complete unit are insulated from the motor and power supply connec-



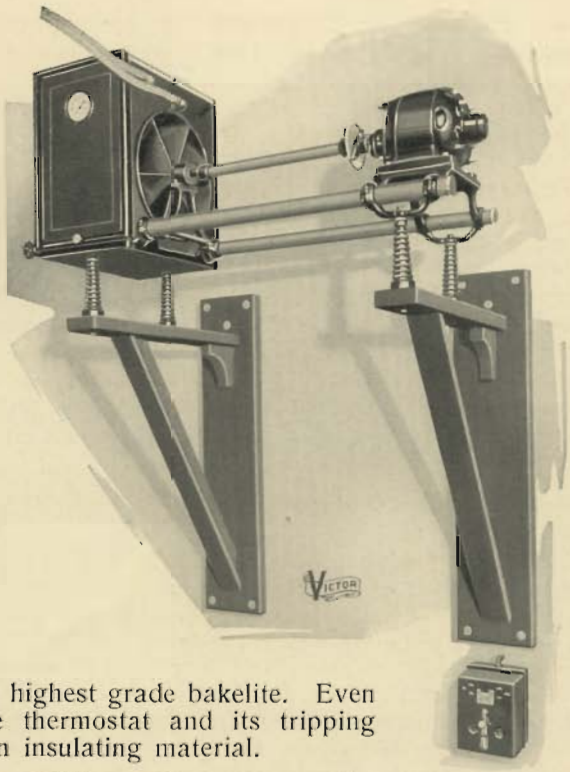


Fig. 21. Illustration of the Victor Water Cooling System from the operating side. Insert is view from radiator side. This system consists of a radiator, behind which are located a high pressure pump and ventilating fan, the latter two connected to the motor by an insulating shaft.

tion by over 20 inches of the highest grade bakelite. Even the connections between the thermostat and its tripping switch are of this well known insulating material.

The supports on which the radiator section rests on the wall bracket are of a special high grade insulating material which prevents leakage from the high tension to any ground.

Flexibility of Installation

This apparatus is so designed that the mounting of the pumping system and motor may be reversed from the positions shown in the accompanying illustration. In such instance the pressure gauge can be changed to the other side of the pump housing.

Being entirely independent of water and sewer connections, the apparatus can be mounted in that room which is best suited for it. Thus it adapts itself to the most practical plan of installation for the complete deep therapy equipment.

The entire cooling system is rigidly supported in one unit, both for shipping and mounting; thus eliminating any possibility of wrenched bearings in shipment and any need for special care in setting up the unit. The alignment is completed, once and for all, at the factory.

Dimensions of Water-Cooling System

The overall length of the water-cooling unit is 55 inches. The installation space is 69 inches in length and 35 inches in width; distance from ceiling to lower edge of wall brackets is 60 inches. These dimensions include 15 inches of insulating air space between the wall and radiator, between side wall and the outfit, and between the ceiling and the radiator top.

Specifications

Code	Cat. No.	
Yewas	V2875	Snook 200 Kv.P. Combination Deep Therapy-Diagnostic Apparatus, arranged for operation on 220-volt, 50-60 cycle Alternating Current, including Cabinet with removable glass panels, and Remote Control Stand; also 10 feet of line cable and 12 feet of conducting cable.
Yewet	V2876	Same as V2875, but for 110-volt, 50-60 cycle Alternating Current.
Yewiv	V2877	Same as V2875, but for 220-volt Direct Current, and without cabinet.
Yewsa	V2878	Same as V2875, but for 110-volt Direct Current, and without cabinet.
		Note: Cabinets are not available with D. C. outfits.
Yasno	V2674	Coolidge Filament Transformer for Deep Therapy equipment.
Yafoz	V2565	Victor-Kearsley Stabilizer.
Yagiz	V2571	Victor Sphere Gap, including insulated suspension posts.
Yagwa	V2574	Milliamperemeter, Type AH, 9 inch diameter (0-10).
Yebbo	V2732	Milliamperemeter, Type AR, 9 inch diameter (0-60).
Yagbo	V2570	Deep Therapy Table, including lead glass protective bowl to accommodate Deep Therapy Coolidge Tubes.
Zanuf	A3430	Copper Filter for Deep Therapy Table, ¼ mm. thick, 6x4¾ inches.
Zanyg	A3431	Coolidge Tube, Air Cooled type for high voltage deep therapy.
Zeljy	A3598	Coolidge Tube, Water-Cooled type, for high voltage deep therapy.
Yeank	V2728	Fittings to adapt above tube to Victor Water-Cooling System.
Yaypa	V2715	Victor Water-Cooling System for Deep Therapy Coolidge Tube, arranged for operation on 220 volt, 60 cycle A. C. Including two 16½ ft. lengths of hose. (Shipping weight approximately 375 pounds).
Yayso	V2716	Same, for operation on 220 volt, D. C.
Yeadz	V2725	Same, for operation on 110 volt, 60 cycle A. C.
Yeahd	V2726	Same, for operation on 110 volt, D. C.
Yeasp	V2729	Support for hose on overhead control system.
Yeaws	V2730	Connection Clamp for hose on Water-Cooled Tube.
Yeaxt	V2731	Supporting Roller for hose on overhead system.

Dimensions of Snook 200 Kv.P.

Without Cabinet:	A. C.	D. C.
Height over all	85½ in.	85½ in.
Width over all	33 in.	33 in.
Length over all	122½ in.	133½ in.

The overall dimensions of the cabinet for the A. C. outfits (only) are: 76 in. high, 38½ in. wide, 128 in. long.

Shipping Weights

A. C. Apparatus with cabinet (approximate)	2782 pounds
A. C. Apparatus without cabinet (approximate)	1982 pounds
D. C. Apparatus without cabinet (approximate)	2232 pounds

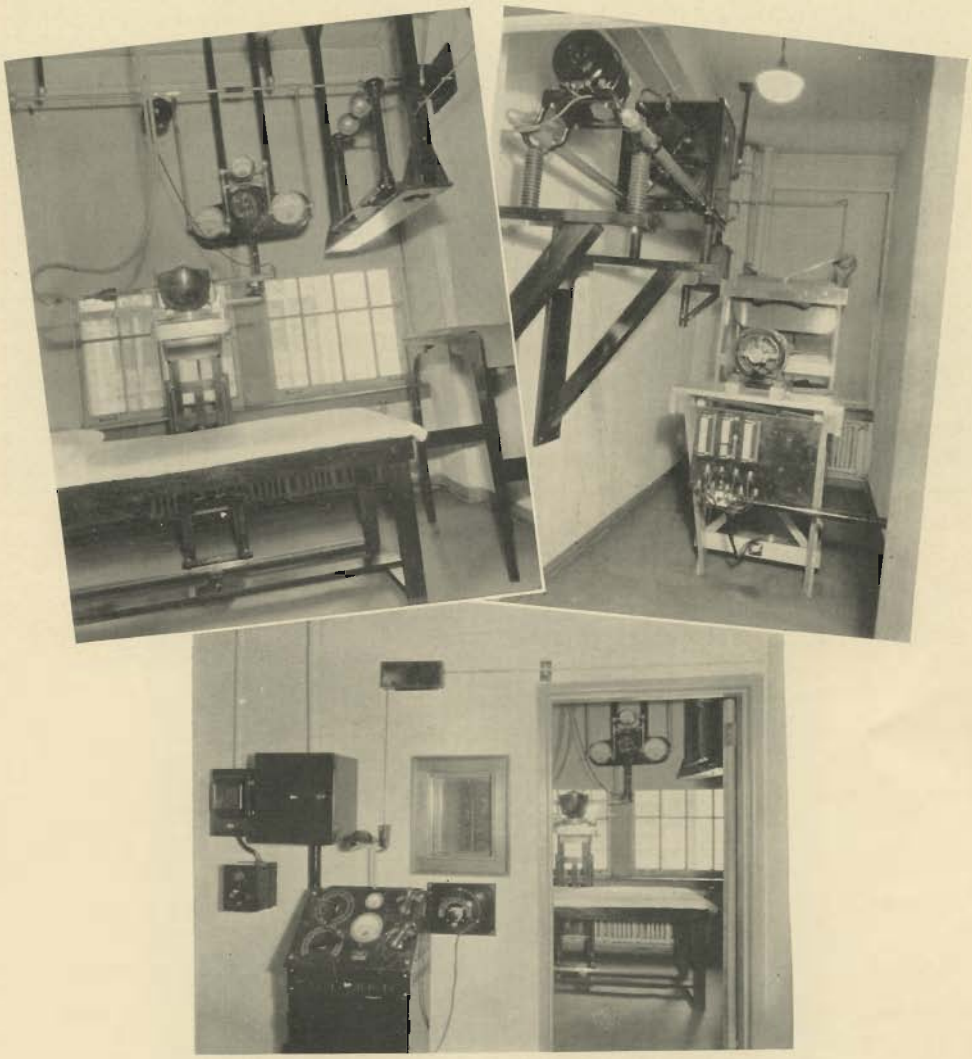


Fig. 22. This deep therapy equipment is so arranged that both the Snook 200 Kv.P. and the Water-Cooling System are remotely installed in a separate room (upper right). The lower picture is taken from the operator's control booth looking into the lead lined treatment room.

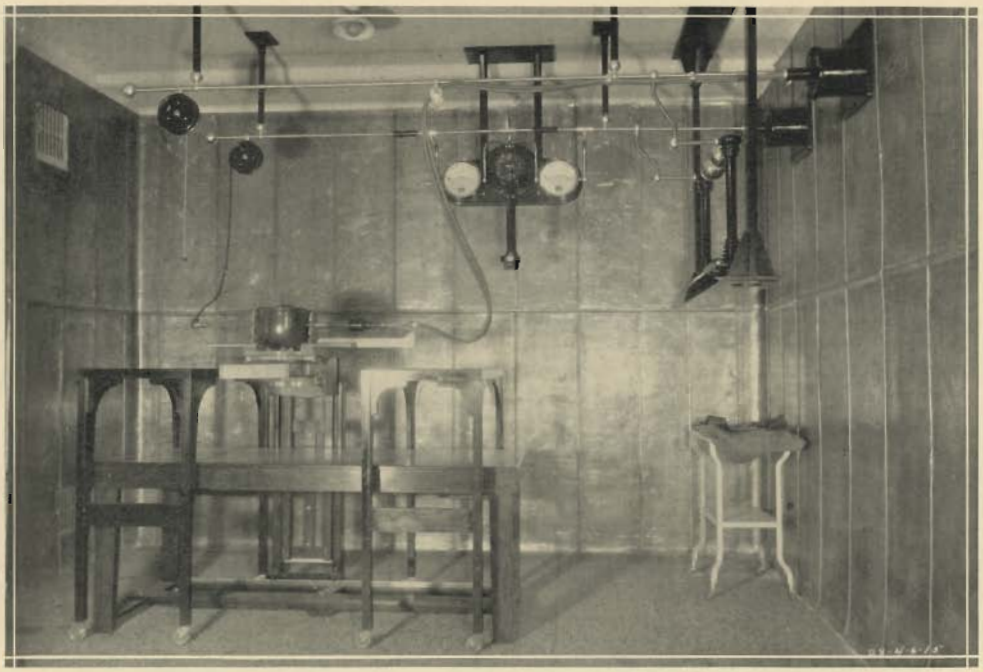


Fig. 23. Another therapy room seen from the operator's control booth. The Snook and Water-Cooling System are in a separate room on the right.

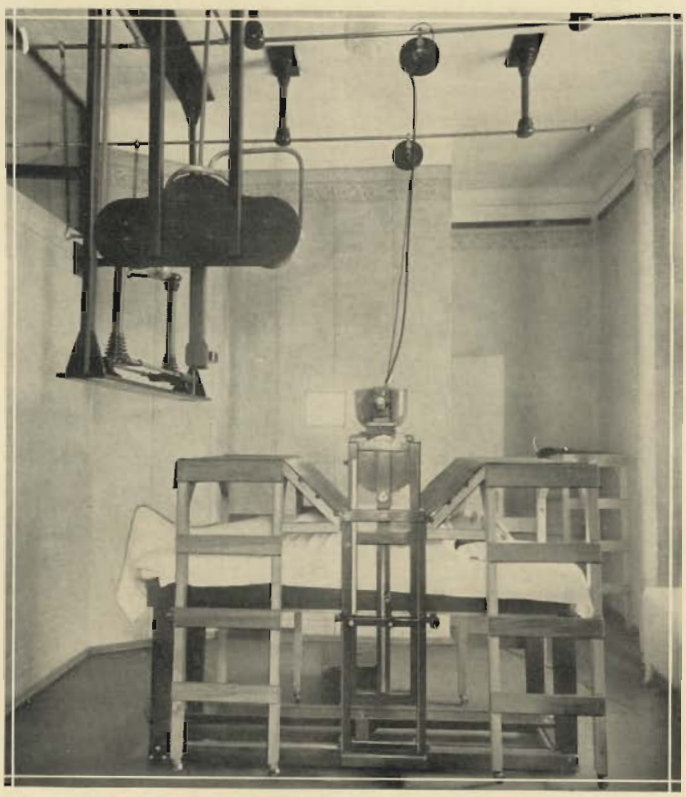
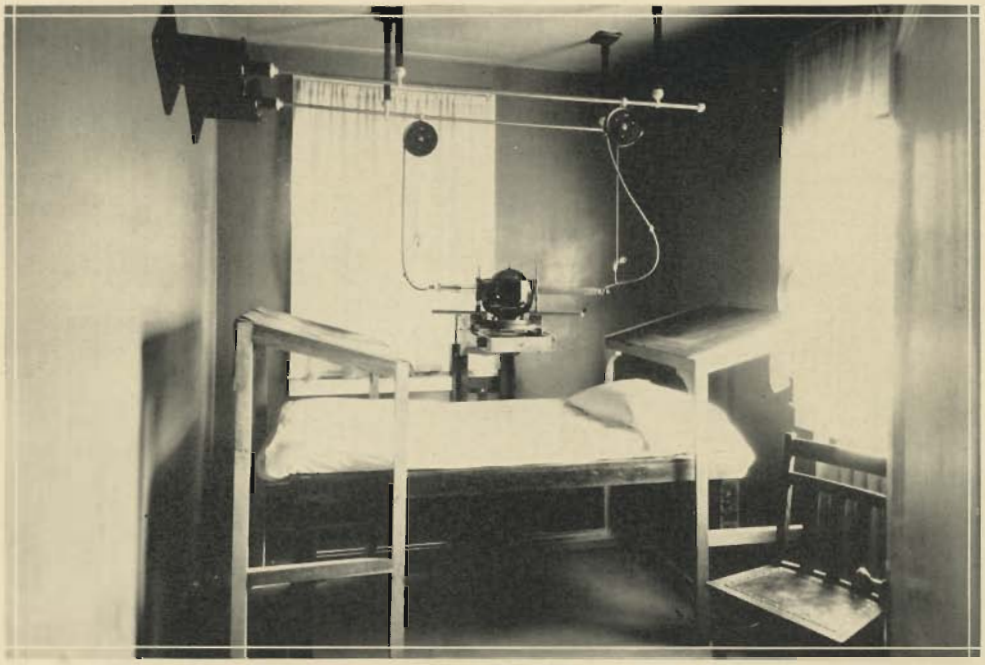
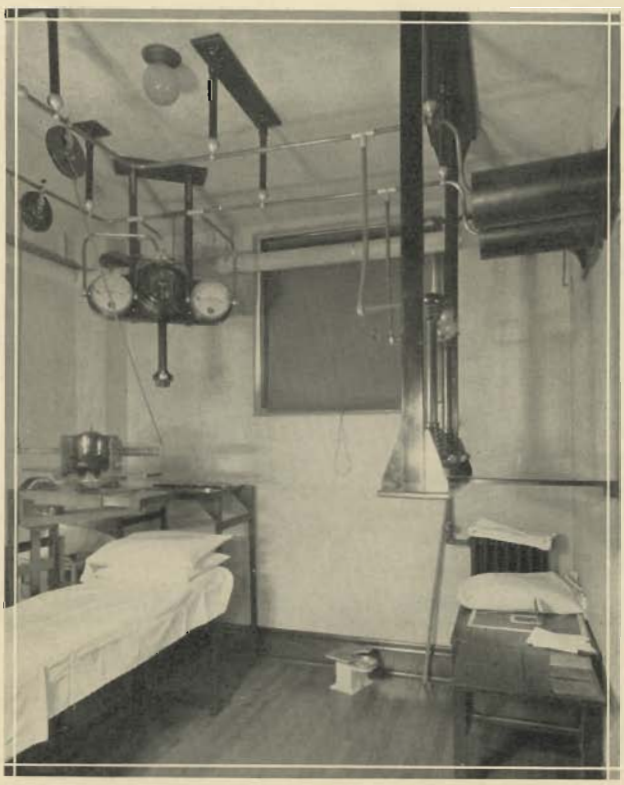


Fig. 24. View of treatment room, using the air-cooled Coolidge tube. Note operator's control booth in background.





Figs. 25 and 26. Views of two other treatment rooms, to show how variations in arrangement may be made according to the nature and amount of space available.

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